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tide linking. It is evident, however, that such tautomeric structures, enol-lactim and keto-lactam, may be present in other groupings, and the results of this investigation in no way limit the lipolytic activity to the peptide linking. In view of the complexity of the protein molecule, it is highly probable that such tautomeric groupings are present in combination with other groups and that the specificities of the actions are in part dependent upon these.

It must be admitted that the treatment of proteins with alkali to form active substances is rather drastic. Unquestionably, simpler methods, comparable to those taking place in nature, will be found to produce the same effects. The fact that dilute alkalis inactivated the castor bean globulin lipase, while a certain higher concentration of alkali produced an ester-hydrolyzing substance from the inactive globulin preparation, indicates that differently placed groups in the molecule were involved in these two changes.

In how far the conclusions reached with lipase may be applied to other enzymes is a question. It seems probable, because of the comparatively simple treatments by which most enzymes may be inactivated, that with them also a simple rearrangement or perhaps tautomeric change is connected with loss in activity. There is, however, no reason to suppose that the active grouping is the same for all enzymes. Each enzyme must be studied separately and conclusions as to the chemical nature of one active enzyme grouping can not without further evidence be applied to an enzyme grouping connected with a different action. The work described with lipase has given a definite point of view, if nothing further, from which the study of this enzyme may be continued, and it seems

probable that similar systematic studies with other enzymes would yield interesting and valuable results.

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### THE CONSERVATION OF WHEAT

THE U. S. Food Administrator has done, and is doing, a splendid work in the conservation of wheat, notwithstanding the many obstacles which he has had to overcome. He has met, with wonderful ability and success, one of the most difficult situations of the ages. At times he has been harassed by self-appointed experts and advisers who have often hindered when they should have helped in the conservation of food, particularly of wheat. This is a time to put aside hobbies and pet theories and look the facts squarely in the face.

One of the suggestions frequently offered to make the wheat crop go farther is to mill it so as to include with the flour a portion, or all, of the wheat by-product, and then to require universal use of such a flour. The present ruling of our Food Administrator, permitting the manufacture of whole-wheat flour and also of flour that contains approximately 75 per cent. of the wheat kernel, rests upon a sound, economic basis. The usual argument of the whole-wheat flour advocates is that the product is more nutritious, and that the wheat can be made to go farther when it is milled so as to include a part or all of the by-product.

The March 8 (1918) issue of SCIENCE contains an article: "Shall We Eat Whole Wheat Bread?" by L. A. Dutcher, in which reference is made to my work on the nutritive value of breads. This article follows the usual trend of the whole-wheat bread advocate. I would make no mention of the article if it were not for the fact that I believe attention should be called to certain omissions, a misquotation and a selective and unusual use of data from my publications that might lead to erroneous conclusions, particularly as one of the bulletins quoted, Minn. No. 54, is no longer in print, or available for distribution.

Dutcher says:

Using Professor Snyder's own digestion coefficients, we find the energy available in patent, whole wheat and graham breads was 90.9, 89.8 and 85.1 respectively.

The reference figure refers to Bulletin 126, U. S. Department of Agriculture, O. E. S. While upwards of thirty individual digestion trials are reported in this bulletin arranged in groups of three tests for each flour, the above figures which Mr. Dutcher uses are not the averages of all the tests on each flour, but he has selected the group of figures which gives the highest energy values for the whole-wheat and graham flours and the lowest for the white. This fact will be observed from the following table compiled from the bulletin mentioned.

AVAILABILITY OF ENERGY OF BREADS

Bul. 126, U. S. Dept. Agr., O.E.S.

	White	Whole Wheat	Graham
From page 29, average of 3 .	90.9	89.8	85.1
From page 29, average of 3 (1899-1900) . . . . .	90.1	85.5	80.7
From page 29, average of 6 .	90.5	87.6	82.9
“ “ 45, “ “ 3 .	90.4	84.2	82.6
“ “ 45, “ “ 3 .	94.2	88	

Dutcher uses the first line of figures (90.9, 89.8, 85.1).

In my work which he assails I have used the average of all results recorded in this and other bulletins of this series. Dutcher could have selected tests where the difference between the two flours was eight per cent. and more instead of about one per cent., had he so desired. (See Bull. 156, U. S. Dept. Agr., O. E. S. p. 56) It can not consistently be argued that this selective use of data does not affect the final conclusion which he draws:

We can rest assured that the difference in digestibility of the two flours is not great.

No data are presented upon which to rest such an assurance.

He attempts to show that my early tests, in 1897, on the digestibility of whole-wheat bread are different from my later tests. He says, quoting from Bulletin No. 54, Minn. Experiment Station:

Omitting details of the separate experiments it was found that there was practically no difference in the total digestibility of breads made from the three kinds of flour (patent, bakers' and whole-wheat flours). This sentence is selected from the article "The Digestibility and Composition of Bread" as noted on the title page of bulletin No. 54.

The quotation is inaccurate. Mr. Dutcher adds the part put in parenthesis, but omits the final conclusion reached that says: (p. 44).

As to the superior merit of whole-wheat flour over ordinary flour, it is more a question as to the quality of the wheat from which each flour has been made.

Omission is also made of the fact that in this test the whole-wheat flour was not milled from the same wheat as the white flour. It was purchased in the open market and "had evidently been made from winter wheat." p. 44. Had Dutcher followed the footnote on page 43 he would have found the patent flour was made from spring wheat, (See Bulletin 67, U. S. Dept. Agr., O. E. S. p. 34.)

It may be argued that his additions to the sentence simply tend to make my meaning clear, and that what he adds is correct. That is not the case. The sentence he quotes begins with: "Omitting details." He has added details. Any additions should have been complete and should have given the reader all the information necessary to understand the sentence when separated from the article. The sentence without Dutcher's additions, and separate from the rest of the text has no special meaning. Dutcher could have quoted a sentence that would have given all the facts, and which would have been complete when separated from the text, namely, the sentence given above summarizing the entire experiment, that the merit of one flour over the other "is more a question as to the quality of the wheat from which each flour has been made." Dutcher's additions to the sentence "(patent bakers' and whole-wheat flours)," without the necessary qualifications, mean products entirely different in character from those of the same name, in all other tests. It is like two

John Smiths, same name, but different persons and with distinguishing characteristics, which he has omitted.

This initial test in 1897 showed the necessity of having the whole-wheat and white flours milled from the same wheat, which was done and so reported in all subsequent work. The necessity of having all flours compared, milled from the same wheat is specifically mentioned in Director True's letter of transmittal<sup>1</sup> to the Secretary of Agriculture. He says:

A special point in connection with Professor Snyder's report is that the different samples of flour used were all ground from the same lot of wheat. His investigations form an unusually satisfactory basis for judging the comparative nutritive value of so-called "graham" flour, which contains the whole-wheat grain and which is really an unbolted wheat meal; so-called "whole-wheat" or "entire-wheat flour" obtained by removing part of the bran and grinding the rest of the kernel; and ordinary patent flour.

In order to make it appear that as large amounts of nutrients are obtained from the whole-wheat as from the white flour, Mr. Dutcher selects the only case where the whole-wheat and white flours were made from different wheats and so indicated in the original, and, omitting to state this, applies this single result with the very large number of results where the two flours are milled alike from the same wheat. Such a method of comparison makes an unwarranted use of my data and is unscientific.

He also states:

Professor Snyder has gone a step farther and makes the assertion that whole-wheat flour is not only less nutritious, but is actually harmful, causing diarrhea and digestive disturbances.

This is not correct. I have never made such a statement. I have repeatedly pointed out the physiological value of whole-wheat flours for correcting some cases of constipation, and also stated that when there is a tendency to diarrhea the whole-wheat bread may aggravate this disturbance, and suggested

that the consumer must determine the fact. Certainly no one else can. This question can, however, be consistently raised as noted later.

In discussing scientific subjects it is unusual to suggest ulterior motives, as he has done; such a procedure is not in the domain of science.

Dutcher gives a summary of some statements in answer to a letter sent out by a "government chemist of prominence," name not given. Any prominent government chemist who at this time really has anything of value to offer would readily have his work accepted and published by the government, and it would not be necessary to get Dutcher to publish it for him. It would be interesting to know if he has presented his views and had them rejected by the government and the Food Administration.

No mention is made of others who have obtained similar results to mine, or to the fact that my work was repeated at the University of Maine by Woods and Merrill and checked at Washington by the U. S. Department of Agriculture, under whose direction the tests were made. They extended over a period of ten years.

Mr. Dutcher makes a vigorous outcry against the price of bran, and advises methods of farming whereby the farmers "would never again resort to the expensive mill feeds." And this at a time when farmers are being urged to raise more wheat! The U. S. Food Administrator permits the miller to take a profit of 50 cents per ton on his bran. The above and others of his statements are made without sustaining facts.

But to return to the subject, "The Conservation of Wheat." It is argued that the wheat crop can be made to go further by using whole-wheat flour. We have an abundance of corn but a shortage of wheat. The question is then: How can we use jointly the two crops to the best advantage?

A pound of wheat by-product used as human food supplies about 500 available calories and about .05 of a pound of digestible protein. A pound of corn meal or corn flour supplies over

<sup>1</sup> O. E. S. Bulletin 101, U. S. Department of Agriculture.

three times as much available energy and 75 per cent. more protein.

The wheat by-product alone has no physical bread-making value; it is exactly on a par with corn meal or any other cereal product that has no gluten. Why, then, should we use wheat by-product in bread-making to conserve wheat, when corn meal, or corn flour or other cereal flours furnishes pound for pound so much more digestible protein and available energy?

The presence of the wheat by-products lowers the amount of other cereal that can be blended with flour. That is, you can not use as much corn, barley or oat flour in combination with whole-wheat flour in making bread as you can when using ordinary white flour. In the rationing of Belgium when whole-wheat flour (82 per cent.) was used, Mr. Robinson Smith, of the Commission for Relief in Belgium, in discussing corn, says:

Its chief value as maize flour was in mixing with the wheat flour up to 11 per cent.

In our bread at the present time 25 per cent. and more corn or other cereal flour is used with white flour. The use of whole-wheat flour *reduces* the amount of other cereal that can be combined and made into bread, and also reduces the amount of available energy and digestible protein contained in the loaf.

Furthermore, wheat by-product is more completely digested by animals than by man, a pound of wheat feed in a mixed ration for animals is worth a little more than a pound of corn.

We have an abundance of corn and a shortage of wheat. Milk is a necessity as human food, also butter, eggs and meat, and these must be produced as cheaply as possible.

When man uses as a bread mixture 75 per cent. white flour and 25 per cent. corn meal or corn flour then all of the wheat by-product is available as animal food, where it is more valuable than when used as human food; while in turn the corn goes farther as human food than the by-product it replaces. This certainly is a valuable and an economical substitution of corn for wheat by-product as it benefits both the human and the animal.

If we should use whole-wheat flour only and 12 per cent. corn flour as a bread mixture, the wheat supply would not last as long as when white flour is used with 25 per cent. of corn flour.

In view of these facts it is not surprising that the U. S. Food Administrator followed the course he did in regard to regulating the milling of flour and the making of bread.

The long extraction flours of other countries are frequently mentioned as an example for the United States to follow. Surely we should profit by their example to the extent of avoiding their mistakes, but there is no reason why we should copy their mistakes and failures. France was the first country to lengthen the extraction of the wheat to 82 per cent. Recently she has gone back to the old standard. (Commerce Reports, U. S. Dept. Commerce, January 7, 1918, p. 79.) The change to long extraction was not a success. Professor Bertrand, chief of the service staff of the Pastuer Institute, has pointed out that in digestion of the long-extraction flours "there are other considerations that tend to reduce" the actual available calories, and that they have not been previously considered, namely: the loss of energy due to the "digestive work" of the "excess of inert substances" in the long-extraction flour. This factor has not been numerically determined but it would still further reduce the available nutrients of the whole wheat. The change of the French government from the long extraction of wheat as a war-time conservation measure back to normal basis is certainly significant. The experiment failed. We should profit by this failure.

The whole wheat and graham advocates usually place great stress upon their wholesomeness, richness in minerals and to certain unknown components to which the name "vitamine" has been applied. A restricted diet may have an insufficient amount of mineral matter or growth-promoting substances, improperly called "vitamines," as well as an insufficient amount or kind of protein, but in a diet with a variety and ample amount of food there is no danger whatever of any deficiency. The U. S. Public Health Service says:

It may be added that a great majority of the people of this country live on a well-balanced, sufficient, mixed diet.<sup>2</sup>

From a recent memorandum for the Secretary of War issued by George W. Goethals, Acting Quartermaster General of the U. S. Army, in reply to a plea for the exclusive use of whole-wheat and graham breads by our soldiers the following quotations are made:

It is recognized that particular care must be observed in the composition of bread. In order to prevent sickness among the civilian population of Italy caused by the use of whole-wheat flour, the Italian government was compelled to fix the percentage of whole wheat at 85 per cent. During the Boer War the British troops in South Africa experienced similar troubles from a like cause. This is due to the fact that the husks or outer covering of the wheat irritate the membranes of the stomach and cause increased intestinal secretions. "This is well known and our trained bakers have been taught to avoid the use of whole wheat flour when possible."

This report of Gen. Goethals is not to be considered lightly.

As to the "vitamine" deficiency of milled products, as white flour, Dr. E. V. McCollum, now of the Johns Hopkins University, in an address before the National Association of American Dairy Food and Drug officials, said:

It is time to warn against the widely heralded teaching that the several diseases recognized as of dietary origin, such as scurvy, beri-beri and possibly pellagra are necessarily due to the absence or to an inadequate supply of "vitamines." We should remember, however, the importance of the other factors of which I have spoken, and in considering the stand to be taken with respect to the milled products, keep in mind that the grains from which they are prepared are themselves singly and collectively as they come from the hand of Nature, incapable of supporting the health of an animal during growth. . . . In closing let me repeat that successful nutrition is not assured by the consumption of the foods just as they are supplied by Nature. It is to be attained only by the judicious combination of foods with a knowledge of their dietary components.

Recognizing this broader conception of nutrition and the necessity of a judicious com-

bination of foods to effect perfect nutrition, then whole-wheat flour and white flour and the grain itself all stand on the same level, for if used either singly or collectively they fail to affect perfect nutrition.

We must conserve wheat. The best way is to use corn and other cereals. In using whole-wheat flour you are still using wheat. Whole-wheat flour has a place in the dietary. It can not, however, replace white flour. Over 90 per cent. of the ordinary whole-wheat flour is composed of white flour. The person who eats whole-wheat flour to conserve wheat only deceives himself. It is better to look the facts squarely in the face and use something else. The way to conserve is to conserve. Make absolutely wheatless meals or wheatless days. It is now necessary to do so. Let us do it cheerfully.

HARRY SNYDER

#### SCIENTIFIC EVENTS

THEODORE CALDWELL JANEWAY, BORN 1872,  
DIED 1917

At a meeting of the board of scientific directors of The Rockefeller Institute for Medical Research, the following minute was adopted:

*Resolved*, that the scientific directors of The Rockefeller Institute record their profound sense of loss in the death of their honored and beloved associate, Theodore Caldwell Janeway, M.D., who has served on the board with devoted zeal since his election to succeed Dr. Christian A. Herter in 1911. Dr. Janeway at the height of his powers and in the midst of the most productive period of his life was stricken with pneumonia while in active service in the Medical Corps of the Army, to which, since the United States entered into war with Germany, he gave invaluable and unmeasured service. His life was sacrificed to patriotic duty rendered to his country without reserve. Dr. Janeway's period of office on the Board of Scientific Directors of The Rockefeller Institute was restricted to a brief seven years, yet its importance was very great, as he brought to its service learning, keen intelligence and broad vision.

Dr. Janeway was a highly skilled and widely read clinician, and he was also a notable exponent of the scientific method in internal

<sup>2</sup> P. H. Reports, Vol. 31, No. 33, p. 2205.